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SOLAR/2018-79/04

Monthly Performance Report

REEDY CREEK UTILITIES

APRIL 1979

U.S. Department of Energy

National Solar Heating and Cooling Demonstration Program

National Solar Data Program

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MONTHLY PERFORMANCE REPORT
REEDY CREEK UTILITIES
APRIL 1979

I. SYSTEM DESCRIPTION

The Reedy Creek site is a two story, 6,100 square foot concrete block office building located in Lake Buena Vista, Florida. The solar energy system is designed to provide space heating, domestic hot water and space cooling.

The collector subsystem is composed of a horizontal array of 16 parabolic trough collectors, manufactured by AAI Corporation, with tracking absorber tubes. The collector array is an integral part of the building's roof, with the reflector troughs oriented so that each major axis is in an east-west direction. The 16 absorber tubes are moved in unison in a north-south direction by the solar tracking system. The total collector aperture area is 3,840 square feet. Water is used as the heat collection, transfer, and storage medium. Collected solar energy is stored in a 10,000-gallon hot water tank, located adjacent to the building and shaded by the roof. Domestic hot water is provided by a heat exchanger immersed in this tank. Space heating is provided by circulation of hot water from the storage tank through heat exchangers located in the central air distribution system. No auxiliary energy is provided for either domestic hot water or space heating.

A 25-ton absorption chiller utilizes hot water from solar storage to provide chilled water to a 10,000-gallon cold water storage tank. For space cooling, water from this cold tank is circulated through heat exchangers located in the building's central air distribution system. Auxiliary cooling is provided by supplemental cold water from the utility district's central chiller plant, which is powered by fossil fuels.

The system, shown schematically in Figure 1, has five modes of solar operation.

Mode 1 - Collector-to-Storage: This mode is entered when the collector absorber plate temperature is 10°F higher than the temperature at the bottom of the hot storage tank (water solar thermal storage). Water is circulated through the collector array-storage loop by pump P1 until the temperature of the water at the bottom of storage rises to within 3°F of that of the collector absorber plate.

Mode 2 - Storage-to-Space Heating: This mode is entered when the temperature falls below the setting of the thermostats located in the occupied areas. Since this is the only means of space heating available, no minimum tank temperature is specified. Pump P2 causes hot water to flow directly from the storage tank to the heat exchanger in the air-handling unit, and back to the storage tank.

Mode 3 - Domestic Hot Water Heating: Domestic hot water (DHW) is provided by passing city supply water through a heat exchanger immersed in the solar thermal storage tank. No conventional water heater exists, thus water is heated only upon demand. A tempering valve is used when necessary to reduce the temperature of water leaving the heat exchanger. If the water is too hot, cold supply water is mixed with it in the tempering valve before going to the domestic hot water line.

Mode 4 - Chilled Water Production: This mode is entered when the temperature of the water in the top of the solar thermal storage tank is at or above the generator operating temperature (nominally 180°F) and that of the water at the bottom of the 10,000-gallon chilled water storage is greater than 45°F. Hot water is drawn from the solar thermal storage tank to operate the generator section of the absorption chiller and cold water is circulated through the chiller from the chilled water storage. Energy is removed from the cold water, lowering its temperature; the energy is rejected though the cooling tower, and the cold water returns to the chilled water storage tank. Whenever the temperature

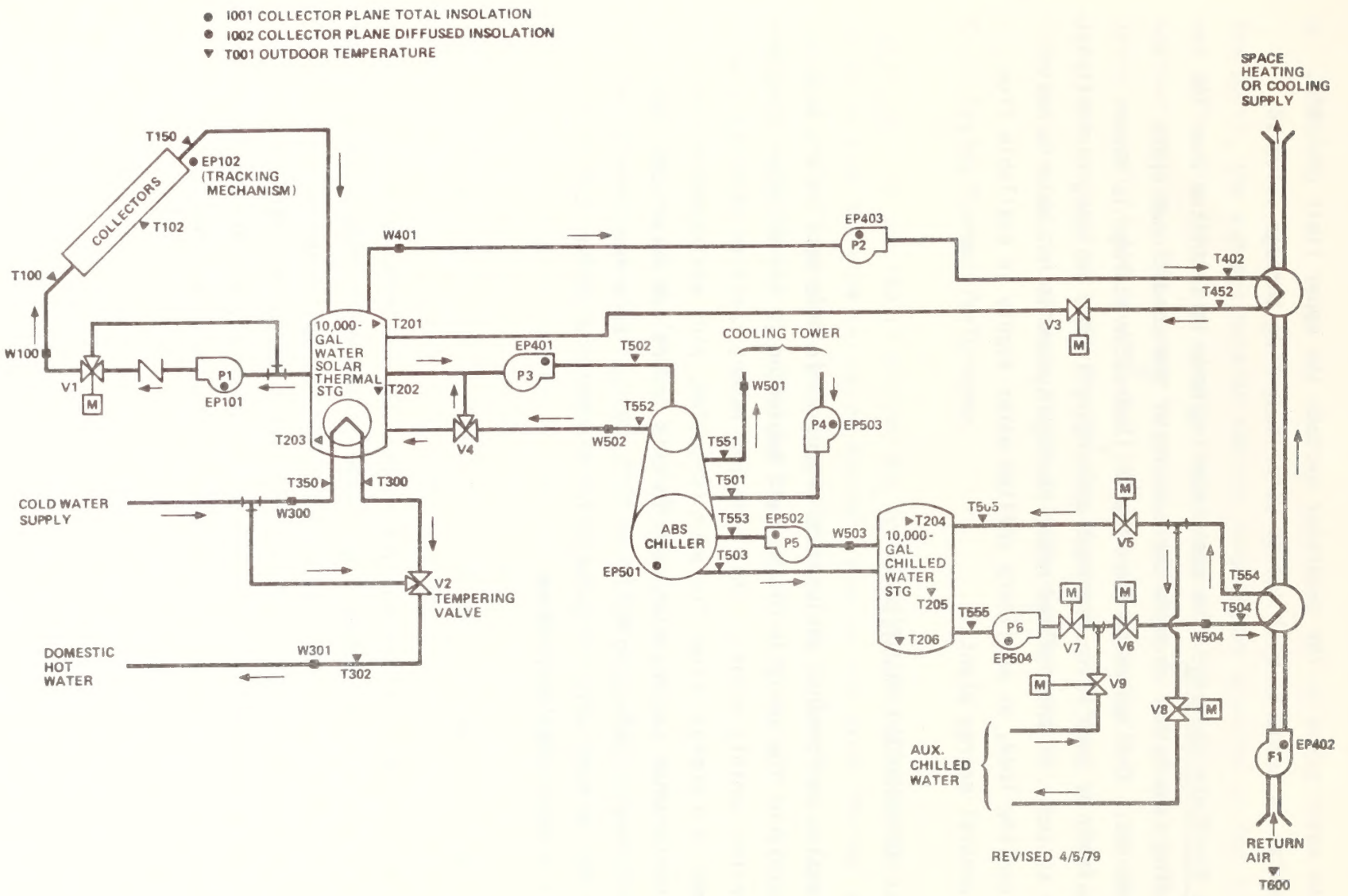

Figure 1. REEDY CREEK SOLAR ENERGY SYSTEM SCHEMATIC

of the water going to the generator exceeds the upper limit of 195°F, the water is tempered with cooler water returning through valve V4.

Mode 5 - Space Cooling: The space cooling mode is initiated when the building temperature exceeds the setting of the conditioned space thermostat. Chilled water from the chilled water storage is then circulated by pump P6 to the heat exchangers in the building air distribution system. If the chilled water storage system is not able to meet the cooling load, an auxiliary chilled water supply is available from the central energy plant.

II. PERFORMANCE EVALUATION

The system performance evaluations discussed in this section are based primarily on the analysis of the data presented in the attached computer-generated monthly report. This attached report consists of daily site thermal and energy values for each subsystem, plus environmental data. The performance factors discussed in this report are based upon the definitions contained in NBSIR 76-1137, Thermal Data Requirements and Performance Evaluation Procedures for the National Solar Heating and Cooling Demonstration Program.

A. Introduction

The Reedy Creek solar energy system operated continuously throughout the month of April. The domestic hot water demand was 0.19 million Btu; the space heating demand was 0.48 million Btu; the space cooling demand was 9.78 million Btu. The solar energy system supplied 100 percent of the domestic hot water and space heating requirements, and 81 percent of the space cooling requirements - these quantities are reported in the attached computer printout as loads.

B. Weather

For April, the average outside ambient temperature measured at the site was 75°F. The long-term average temperature is 72°F at the Orlando weather station. The average measured insolation in the plane of the array was only 1,642 Btu/ft^2-day. This is considerably less than the long-term average of 1,896 Btu/ft^2-day for April, which was derived from measurements also taken at the Orlando weather station.

C. System Thermal Performance

Collector - Of the 189.13 million Btu incident on the collector array, 28.80 million Btu were collected and delivered to the solar thermal storage tank. This represents an array efficiency of 15.2 percent. Operating energy of 1.43 Million Btu (419 kwh) was required to collect and store this solar energy.

Storage - Of the 28.80 million Btu delivered to storage, 15.93 million Btu were subsequently removed for use within the system. Temperature probes within the solar thermal storage tank indicate that the internal energy of the water decreased by 0.89 million Btu during the month. This indicates a resulting loss to the environment of 11.88 million Btu through the tank insulation. A further discussion of the tank insulation heat transfer is contained in Section II-D, Observations.

Domestic Hot Water - Domestic hot water is provided to the building by passing city water through a heat exchanger that is immersed in the solar thermal storage tank. A total of 383 gallons of water at an average temperature of 130°F were supplied by this system during April. The average temperature increase was 60°F, which resulted in a measured demand of 0.19 million Btu. All of this energy was supplied by the solar energy system. There was no operating energy required.

Space Heating - Space heating was required during a portion of six different days during April. Hot water was pumped from the solar thermal storage tank to a heat exchanger coil in the air ducts to satisfy this requirement. An operating energy expenditure of 0.08 million Btu (23 kwh) was required to satisfy the 0.48 million Btu demand.

Absorption Chiller - The absorption chiller operated on 13 occasions to reduce the chilled water storage temperature during April. Use of 0.73 million Btu of electrical energy from the auxiliary conventional cooling system was required to assist the absorption chiller to meet the cooling load on nine days of the month. The absorption chiller utilized 15.26 million Btu from the solar thermal storage tank to remove 9.20 million Btu from the chilled water storage (see attached Auxiliary Performance data). The resulting coefficient of performance of 0.602 is slightly higher than that experienced in the past few months. It is the result of consistently good solar energy collection which maintained a high storage tank temperature, and consistent operation of the chiller at generator and evaporator temperatures which result in high efficiency.

Chilled Water Storage - Performance of the chilled water storage (see attached Auxiliary Storage Performance data) shows that 9.20 million Btu were removed by the chiller, 7.96 million Btu were added from the conditioned space during cooling, and the internal energy of the chilled water storage decreased by 0.22 million Btu. This implies that 1.02 million Btu were gained by the water from the ambient environment through the insulation.

Space Cooling - Space cooling was required on all of the working days of the month. The space cooling load was 9.78 million Btu. Water from the chilled water storage was pumped through the air duct heat exchangers to remove 7.96 million Btu. Chilled water from the central plant was required to assist in supporting the cooling load during nine days of the month. This resulted from the previous use of the chilled water storage for space cooling, which had raised the storage temperature to a level near the room temperature. Meanwhile, sufficient solar energy had not been collected to allow use of the absorption chiller.

D. Observations

During the month of April, the ratio of direct to diffuse solar radiation was quite high, due to a lack of cloud cover. The solar collectors essentially collect only direct solar radiation due to the reflector geometry and, therefore, a relatively large amount of solar energy was collected during April. As a result of this, the absorption chiller operated at a high efficiency while being supplied with this high temperature thermal energy.

Losses from the storage tank during April were relatively large, at 11.88 million Btu. This loss during the month of March was only slightly smaller, being 8.5 million Btu. Both of these values are larger than would be expected for the insulated storage tank, and larger than has been experienced in previous months. The mode of this energy loss from the tank, if not through the insulation, cannot be detected with the current instrumentation present at the site. This loss which is larger than previous months may be due to instrumentation changes which were made at the site during February. Speculation as to the method of loss might include very low flow conditions through the collectors during non-collection periods. This might occur as the result of thermosyphoning from the storage tank, or occasional short cycling of the collector pumps, which would generally not be seen when occurring between data scans by the instrumentation package.

E. Energy Savings

Total system electrical energy savings of -0.4 million Btu (-123 kwh) (expense) were realized. This value assumes that, had there not been a solar energy system, the energy requirements would have been met by an electrical hot water heater and by a conventional electrical heat pump. The value of energy savings is negative this month, primarily

as a result of the extremely low space heating load. Space heating electrical savings which result from a greater load are generally larger than the collector operating energy, and normally result in a net electrical savings.

III. ACTION STATUS

The discrepancy of the temperature sensor at the generator exit of the absorption chiller is being investigated.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SITE: REEDY CREEK
REPORT PERIOD: APRIL,1979

SOLAR/2018-79/04

SITE/SYSTEM DESCRIPTION:
THE REEDY CREEK SITE IS A 6100 SQ. FT. CONCRETE BLOCK OFFICE BUILDING. THE LIQUID SYSTEM EMPLOYS 3840 SQ. FT. OF PARABOLIC TROUGH COLLECTORS WHICH FORM AN INTEGRAL PART OF THE ROOF. THE SYSTEM IS DESIGNED TO PROVIDE SPACE HEATING, COOLING, AND DOMESTIC HOT WATER. STORAGE CONSISTS OF 10,000 GALLONS OF BOTH HOT AND COLD WATER. AN ABSORPTION CYCLE CHILLER PROVIDES COOLING, A RADIANT HOT WATER COIL PROVIDES HEATING AND A COIL SUBMERGED I THE HOT STORAGE TANK PROVIDES HOT WATER. AUXILIARY COOLING IS PROVIDED BY CHILLED WATER FROM THE CENTRAL COOLING PLANT. THERE IS NO AUXILIARY DHW OR HEATING.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	189.129 MILLION BTU
	49252 BTU/SQ.FT.
COLLECTED SOLAR ENERGY	28.799 MILLION BTU
	7500 BTU/SQ.FT.
AVERAGE AMBIENT TEMPERATURE	75 DEGREES F
AVERAGE BUILDING TEMPERATURE	74 DEGREES F
ECSS SOLAR CONVERSION EFFICIENCY	0.08
ECSS OPERATING ENERGY	1.427 MILLION BTU
TOTAL SYSTEM OPERATING ENERGY	5.461 MILLION BTU
TOTAL ENERGY CONSUMED	34.987 MILLION BTU

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	0.191	0.477	9.781	10.450 MILLION BTU
SOLAR FRACTION	100	100	81	83 PERCENT
SOLAR ENERGY USED	0.191	0.477	15.264	15.932 MILLION BTU
OPERATING ENERGY	N.A.	0.085	3.949	5.461 MILLION BTU
AUX. THERMAL ENERGY	N.A.	N.A.	1.817	1.817 MILLION BTU
AUX. ELECTRIC FUEL	N.A.	N.A.	0.727	0.727 MILLION BTU
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A. MILLION BTU
ELECTRICAL SAVINGS	0.191	0.175	0.643	-0.419 MILLION BTU
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A. MILLION BTU

SYSTEM PERFORMANCE FACTOR: 0.507

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978, SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SITE SUMMARY

SOLAR/2018-79/04

SITE: REEDY CREEK
REPORT PERIOD: APRIL,1979

SITE/SYSTEM DESCRIPTION:
THE REEDY CREEK SITE IS A 6100 SQ. FT. CONCRETE BLOCK OFFICE BUILDING. THE LIQUID SYSTEM EMPLOYS 3840 SQ. FT. OF PARABOLIC TROUGH COLLECTORS WHICH FORM AN INTEGRAL PART OF THE ROOF. THE SYSTEM IS DESIGNED TO PROVIDE SPACE HEATING, COOLING, AND DOMESTIC HOT WATER. STORAGE CONSISTS OF 10,000 GALLONS OF BOTH HOT AND COLD WATER. AN ABSORPTION CYCLE CHILLER PROVIDES COOLING, A RADIANT HOT WATER COIL PROVIDES HEATING AND A COIL SUBMERGED IN THE HOT STORAGE TANK PROVIDES HOT WATER. AUXILIARY COOLING IS PROVIDED BY CHILLED WATER FROM THE CENTRAL COOLING PLANT. THERE IS NO AUXILIARY DHW OR HEATING.

GENERAL SITE DATA:

INCIDENT SOLAR ENERGY	199.531 GIGA JOULES
	559310 KJ/SQ.M.
COLLECTED SOLAR ENERGY	30.383 GIGA JOULES
	85167 KJ/SQ.M.
AVERAGE AMBIENT TEMPERATURE	24 DEGREES C
AVERAGE BUILDING TEMPERATURE	23 DEGREES C
ECSS SOLAR CONVERSION EFFICIENCY	0.08
ECSS OPERATING ENERGY	1.506 GIGA JOULES
TOTAL SYSTEM OPERATING ENERGY	5.761 GIGA JOULES
TOTAL ENERGY CONSUMED	36.911 GIGA JOULES

SUBSYSTEM SUMMARY:

	HOT WATER	HEATING	COOLING	SYSTEM TOTAL
LOAD	0.201	0.504	10.319	11.024 GIGA JOULES
SOLAR FRACTION	100	100	81	83 PERCENT
SOLAR ENERGY USED	0.201	0.504	16.103	16.808 GIGA JOULES
OPERATING ENERGY	N.A.	0.089	4.166	5.761 GIGA JOULES
AUX. THERMAL ENG	N.A.	N.A.	1.917	1.917 GIGA JOULES
AUX. ELECTRIC FUEL	N.A.	N.A.	0.767	0.767 GIGA JOULES
AUX. FOSSIL FUEL	N.A.	N.A.	N.A.	N.A. GIGA JOULES
ELECTRICAL SAVINGS	0.201	0.185	0.678	-0.442 GIGA JOULES
FOSSIL SAVINGS	N.A.	N.A.	N.A.	N.A. GIGA JOULES

SYSTEM PERFORMANCE FACTOR: 0.507

* DENOTES UNAVAILABLE DATA
@ DENOTES NULL DATA
N.A. DENOTES NOT APPLICABLE DATA

REFERENCE: USER'S GUIDE TO THE MONTHLY PERFORMANCE REPORT OF THE NATIONAL SOLAR DATA PROGRAM,FEBRUARY 28,1978. SOLAR/0004-78/18

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENERGY COLLECTION AND STORAGE SUBSYSTEM (ECSS)

SITE: REEDY CREEK
REPORT PERIOD: APRIL,1979

SOLAR/2018-79/04

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	AMBIENT TEMP DEG-F	ENERGY TO LOADS MILLION BTU	AUX THERMAL TO ECSS MILLION BTU	ECSS OPERATING ENERGY MILLION BTU	ECSS ENERGY REJECTED MILLION BTU	ECSS SOLAR CONVERSION EFFICIENCY
1	5.621	74	-0.000	N	0.034	N	-0.000
2	6.099	76	0.043	O	0.047	O	0.007
3	5.805	77	1.287	T	0.037	T	0.222
4	6.007	77	0.003		0.049		0.000
5	3.504	72	0.008	A	0.020	A	0.002
6	8.446	68	2.328	P	0.079	P	0.276
7	8.397	69	1.242	P	0.079	P	0.148
8	7.672	73	0.115	L	0.071	L	0.015
9	5.488	74	0.757	I	0.036	I	0.138
10	*	*	*	C	*	C	*
11	7.396	79	0.009	A	0.058	A	0.001
12	6.271	79	0.014	B	0.052	B	0.002
13	6.631	79	1.409	L	0.048	L	0.213
14	5.477	78	0.000	E	0.034	E	0.000
15	8.140	78	1.583		0.077		0.194
16	8.581	72	1.047		0.076		0.122
17	8.458	72	1.259		0.080		0.149
18	*	*	*		*		*
19	8.045	75	0.889		0.073		0.110
20	7.668	76	0.083		0.066		0.011
21	6.337	75	0.870		0.044		0.137
22	5.566	73	0.000		0.031		0.000
23	5.891	74	0.045		0.029		0.008
24	0.762	70	0.009		0.000		0.012
25	2.039	71	0.009		0.000		0.004
26	6.651	75	0.006		0.051		0.001
27	6.687	76	0.013		0.041		0.002
28	6.263	75	0.360		0.040		0.057
29	8.248	76	1.470		0.071		0.178
30	4.371	74	0.012		0.010		0.003
SUM	189.129	-	15.932	N.A.	1.427	N.A.	-
AVG	6.304	75	0.531	N.A.	0.048	N.A.	0.084
NBS ID	Q001	N113			Q102		N111

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
COLLECTOR ARRAY PERFORMANCE

SITE: REEDY CREEK
REPORT PERIOD: APRIL,1979

SOLAR/2018-79/04

DAY OF MONTH	INCIDENT SOLAR ENERGY MILLION BTU	OPERATIONAL INCIDENT ENERGY MILLION BTU	COLLECTED SOLAR ENERGY MILLION BTU	DAYTIME AMBIENT TEMP DEG F	COLLECTOR ARRAY EFFICIENCY
1	5.621	2.961	0.376	82	0.067
2	6.099	4.101	0.714	83	0.117
3	5.805	3.292	0.593	85	0.102
4	6.007	4.577	0.804	84	0.134
5	3.504	1.976	0.306	79	0.087
6	8.446	7.555	2.012	76	0.238
7	8.397	7.539	1.995	81	0.238
8	7.672	6.524	1.487	83	0.194
9	5.488	3.150	0.450	83	0.082
10	*	*	*	*	*
11	7.396	5.215	0.984	85	0.133
12	6.271	4.198	0.741	86	0.118
13	6.631	4.540	0.810	85	0.122
14	5.477	3.235	0.595	84	0.109
15	8.140	7.178	1.651	86	0.203
16	8.581	7.501	2.065	81	0.241
17	8.458	7.484	2.048	83	0.242
18	*	*	*	*	*
19	8.045	6.897	1.890	85	0.235
20	7.668	6.075	1.418	86	0.185
21	6.337	4.088	0.802	86	0.127
22	5.566	2.521	0.382	79	0.069
23	5.891	2.481	0.304	81	0.052
24	0.762	0.000	0.000	70	0.000
25	2.039	0.000	0.000	74	0.000
26	6.651	4.668	1.087	82	0.163
27	6.687	3.690	0.704	84	0.105
28	6.263	3.681	0.702	83	0.112
29	8.248	6.883	1.864	87	0.226
30	4.371	1.065	0.095	83	0.022
SUM	189.129	131.867	28.799	-	-
AVG	6.304	4.396	0.960	82	0.152
NBSID	Q001		Q100		N100

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
STORAGE PERFORMANCE

SITE: REEDY CREEK
REPORT PERIOD: APRIL,1979

SOLAR/2018-79/04

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	CHANGE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.376	-0.000	0.115	164	0.306
2	0.714	0.043	0.439	169	0.675
3	0.593	1.287	-1.068	166	0.370
4	0.804	0.003	0.461	160	0.577
5	0.306	0.008	0.063	164	0.233
6	2.012	2.328	-0.556	163	0.881
7	1.995	1.242	0.241	161	0.743
8	1.487	0.115	1.129	166	0.837
9	0.450	0.757	-0.543	170	0.474
10	*	*	*	*	*
11	0.984	0.009	-0.696	161	-0.697
12	0.741	0.014	0.575	167	0.795
13	0.810	1.409	-0.805	167	0.746
14	0.595	0.000	0.325	163	0.546
15	1.651	1.583	-0.220	166	0.826
16	2.065	1.047	-0.052	164	0.481
17	2.048	1.259	-0.021	163	0.605
18	*	*	*	*	*
19	1.890	0.889	-0.011	163	0.465
20	1.418	0.083	0.711	166	0.561
21	0.802	0.870	-0.753	166	0.145
22	0.382	0.000	0.010	160	0.027
23	0.304	0.045	0.052	161	0.322
24	0.000	0.009	-0.304	159	1.000
25	0.000	0.009	-0.273	156	1.000
26	1.087	0.006	0.902	160	0.835
27	0.704	0.013	0.376	168	0.552
28	0.702	0.360	-0.010	172	0.498
29	1.864	1.470	-0.733	164	0.395
30	0.095	0.012	-0.189	160	-1.872
SUM	28.799	15.932	-0.892	-	-
AVG	0.960	0.531	-0.030	164	0.522
NBS ID	Q200	Q201	Q202		N108

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
HOT WATER SUBSYSTEM

SITE: REEDY CREEK
REPORT PERIOD: APRIL,1979

SOLAR/2018-79/04

DAY OF MON.	HOT WATER LOAD MILLION BTU	SOLAR FR.OF LOAD PER CENT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	SUP. WAT. TEMP DEG F	HOT WAT. TEMP DEG F	HOT WATER USED GAL
1	-0.000	100	-0.000	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	NOT APPLICABLE	-0.000	NOT APPLICABLE	70	70	2
2	0.008	100	0.008					0.008		70	111	15
3	0.011	100	0.011					0.011		70	139	21
4	0.003	100	0.003					0.003		70	130	6
5	0.008	100	0.008					0.008		70	128	17
6	0.008	100	0.008					0.008		70	135	17
7	0.001	100	0.001					0.001		70	127	2
8	0.000	0	0.000					0.000		70	122	0
9	0.007	100	0.007					0.007		70	129	13
10	*	*	*					*		*	*	*
11	0.009	100	0.009					0.009		70	131	21
12	0.011	100	0.011					0.011		70	136	21
13	0.009	100	0.009					0.009		70	142	17
14	0.000	0	0.000					0.000		70	145	0
15	0.000	0	0.000					0.000		70	145	0
16	0.008	100	0.008					0.008		70	137	16
17	0.015	100	0.015					0.015		70	137	27
18	*	*	*					*		*	*	*
19	0.012	100	0.012					0.012		70	134	21
20	0.010	100	0.010					0.010		70	131	18
21	0.000	0	0.000					0.000		70	132	0
22	0.000	0	0.000					0.000		70	132	0
23	0.010	100	0.010					0.010		70	128	20
24	0.009	100	0.009					0.009		70	131	18
25	0.009	100	0.009					0.009		70	124	22
26	0.006	100	0.006					0.006		70	128	13
27	0.013	100	0.013					0.013		70	137	25
28	0.000	0	0.000					0.000		70	138	0
29	0.000	0	0.000					0.000		70	138	0
30	0.012	100	0.012					0.012		70	130	26
SUM	0.191	-	0.191	N.A.	N.A.	N.A.	N.A.	0.191	N.A.	-	-	383
AVG	0.006	100	0.006	N.A.	N.A.	N.A.	N.A.	0.006	N.A.	70	130	13
NBS	Q302	N300	Q300	Q303	Q301	Q305	Q306	Q311	Q313	N305	N307	N308

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE HEATING SUBSYSTEM

SITE: REEDY CREEK
REPORT PERIOD: APRIL,1979

SOLAR/2018-79/04

DAY OF MON.	SPACE HEATING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG TEMP DEG. F	AMB TEMP DEG. F
1	0.000	0	0.000	0.000	N	N	N	0.000	N	75	74
2	0.035	100	0.035	0.010	O	O	O	0.012	O	75	76
3	0.000	0	0.000	0.000	T	T	T	0.000	T	77	77
4	0.000	0	0.000	0.000				0.000		77	77
5	0.000	0	0.000	0.000	A	A	A	0.000	A	74	72
6	0.197	100	0.197	0.023	P	P	P	0.075	P	70	68
7	0.000	0	0.000	0.000	P	P	P	0.000	P	68	69
8	0.000	0	0.000	0.000	L	L	L	0.000	L	72	73
9	0.032	100	0.032	0.010	I	I	I	0.011	I	75	74
10	*	*	*	*	C	C	C	*	C	*	*
11	0.000	0	0.000	0.000	A	A	A	0.000	A	77	79
12	0.000	0	0.000	0.000	B	B	B	0.000	B	77	79
13	0.000	0	0.000	0.000	L	L	L	0.000	L	77	79
14	0.000	0	0.000	0.000	E	E	E	0.000	E	79	78
15	0.000	0	0.000	0.000				0.000		78	78
16	0.009	100	0.009	0.004				0.003		72	72
17	0.137	100	0.137	0.022				0.051		70	72
18	*	*	*	*				*		*	*
19	0.000	0	0.000	0.000				0.000		73	75
20	0.000	0	0.000	0.000				0.000		73	76
21	0.000	0	0.000	0.000				0.000		75	75
22	0.000	0	0.000	0.000				0.000		73	73
23	0.036	100	0.036	0.009				0.012		73	74
24	0.000	0	0.000	0.000				0.000		74	70
25	0.000	0	0.000	0.000				0.000		74	71
26	0.000	0	0.000	0.000				0.000		74	75
27	0.000	0	0.000	0.000				0.000		75	76
28	0.000	0	0.000	0.000				0.000		76	75
29	0.000	0	0.000	0.000				0.000		74	76
30	0.000	0	0.000	0.000				0.000		74	74
SUM	0.477	-	0.477	0.085	N.A.	N.A.	N.A.	0.175	N.A.	-	-
AVG	0.016	100	0.016	0.003	N.A.	N.A.	N.A.	0.006	N.A.	74	75
NBS	Q402	N400	Q400	Q403	Q401		Q410	Q415	Q417	N406	N113

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
SPACE COOLING SUBSYSTEM

SITE: REEDY CREEK
REPORT PERIOD: APRIL,1979

SOLAR/2018-79/04

DAY OF MON.	SPACE COOLING LOAD MILLION BTU	SOLAR FR.OF LOAD PCT	SOLAR ENERGY USED MILLION BTU	OPER ENERGY MILLION BTU	AUX THERMAL USED MILLION BTU	AUX ELECT FUEL MILLION BTU	AUX FOSSIL FUEL MILLION BTU	ELECT ENERGY SAVINGS MILLION BTU	FOSSIL ENERGY SAVINGS MILLION BTU	BLDG DRY BULB TEMP F	AMB TEMP DEG F
1	0.000	0	0.000	0.000	0.000	0.000	N	0.000	N	75	74
2	0.597	100	0.000	0.119	0.000	0.000	O	0.212	O	75	76
3	0.500	79	1.276	0.242	0.105	0.042	T	-0.013	T	77	77
4	0.573	71	0.000	0.078	0.167	0.067		0.150		77	77
5	0.294	71	0.000	0.059	0.086	0.034	A	0.073	A	74	72
6	0.562	100	2.123	0.333	0.000	0.000	P	0.005	P	70	68
7	0.000	0	1.241	0.283	0.000	0.000	P	-0.283	P	68	69
8	0.000	0	0.115	0.121	0.000	0.000	L	-0.121	L	72	73
9	0.058	100	0.718	0.117	0.000	0.000	I	-0.088	I	75	74
10	*	*	*	*	*	*	C	*	C	*	*
11	0.750	92	0.000	0.122	0.062	0.025	A	0.254	A	77	79
12	0.288	68	0.004	0.048	0.091	0.036	B	0.072	B	77	79
13	0.644	40	1.400	0.232	0.384	0.154	L	-0.052	L	77	79
14	0.000	0	0.000	0.000	0.000	0.000	E	0.000	E	79	78
15	0.000	0	1.583	0.225	0.000	0.000		-0.225		78	78
16	0.059	100	1.030	0.231	0.000	0.000		-0.203		72	72
17	0.062	100	1.107	0.186	0.000	0.000		-0.155		70	72
18	*	*	*	*	*	*		*		*	*
19	0.696	100	0.877	0.233	0.000	0.000		0.125		73	75
20	0.625	100	0.073	0.123	0.000	0.000		0.202		73	76
21	0.000	0	0.870	0.119	0.000	0.000		-0.119		75	75
22	0.000	0	0.000	0.000	0.000	0.000		0.000		73	73
23	0.604	100	0.000	0.113	0.000	0.000		0.211		73	74
24	0.489	85	0.000	0.118	0.074	0.030		0.145		74	70
25	0.302	100	0.000	0.092	0.000	0.000		0.103		74	71
26	0.991	33	0.000	0.151	0.668	0.267		0.112		74	75
27	0.288	80	0.000	0.067	0.058	0.023		0.081		75	76
28	0.000	0	0.360	0.000	0.000	0.000		0.000		76	75
29	0.000	0	1.470	0.156	0.000	0.000		-0.156		74	76
30	0.748	100	0.000	0.117	0.000	0.000		0.270		74	74
SUM	9.781	-	15.264	3.949	1.817	0.727	N.A.	0.643	N.A.	-	-
AVG	0.326	81	0.509	0.132	0.060	0.024	N.A.	0.021	N.A.	74	75
NBS	Q502	N500	Q500	Q503	Q501		Q508	Q512	Q514	N406	N113

* DENOTES UNAVAILABLE DATA.
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SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
ENVIRONMENTAL SUMMARY

SITE: REEDY CREEK
REPORT PERIOD: APRIL,1979

SOLAR/2018-79/04

DAY OF MONTH	TOTAL INSOLATION BTU/SQ.FT	DIFFUSE INSOLATION BTU/SQ.FT	AMBIENT TEMPERATURE DEG F	DAYTIME AMBIENT TEMP DEG F	RELATIVE HUMIDITY PERCENT	WIND DIRECTION DEGREES	WIND SPEED M.P.H.
1	1464	681	74	82	N	N	N
2	1588	468	76	83	O	O	O
3	1512	653	77	85	T	T	T
4	1564	569	77	84			
5	913	421	72	79	A	A	A
6	2200	152	68	76	P	P	P
7	2187	123	69	81	P	P	P
8	1998	251	73	83	L	L	L
9	1429	652	74	83	I	I	I
10	*	*	*	*	C	C	C
11	1926	664	79	85	A	A	A
12	1633	542	79	86	B	B	B
13	1727	633	79	85	L	L	L
14	1426	640	78	84	E	E	E
15	2120	323	78	86			
16	2235	197	72	81			
17	2203	193	72	83			
18	*	*	*	*			
19	2095	303	75	85			
20	1997	376	76	86			
21	1650	601	75	86			
22	1450	597	73	79			
23	1534	774	74	81			
24	198	147	70	70			
25	531	413	71	74			
26	1732	532	75	82			
27	1741	729	76	84			
28	1631	720	75	83			
29	2148	355	76	87			
30	1138	779	74	83			
SUM	49252	14452	-	-	-	-	-
AVG	1642	482	75	82	N.A.	N.A.	N.A.
NBS ID	Q001		N113			N115	N114

* DENOTES UNAVAILABLE DATA.
@ DENOTES NULL DATA.
N.A. DENOTES NOT APPLICABLE DATA.

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
THERMODYNAMIC CONVERSION EQUIPMENT

SITE: REEDY CREEK
REPORT PERIOD: APRIL,1979

SOLAR/2018-79/04

DAY OF MONTH	EQUIPMENT LOAD MILLION BTU	THERMAL ENERGY INPUT MILLION BTU	OPERATING ENERGY MILLION BTU	ENERGY REJECTED MILLION BTU	COEFFICIENT OF PERFORMANCE (SEE NOTE)
1	0.000	0.000	0.000	0.000	0.000
2	0.000	0.000	0.000	0.000	0.000
3	0.798	1.276	0.157	2.256	0.625
4	0.000	0.000	0.000	0.000	0.000
5	0.000	0.000	0.000	0.000	0.000
6	1.277	2.123	0.193	3.661	0.602
7	0.601	1.241	0.283	1.862	0.485
8	0.031	0.115	0.121	0.027	0.272
9	0.353	0.718	0.087	1.093	0.492
10	*	*	*	*	*
11	0.000	0.000	0.000	0.000	0.000
12	-0.004	0.004	0.001	0.000	-1.203
13	0.835	1.400	0.145	2.327	0.596
14	0.000	0.000	0.000	0.000	0.000
15	0.730	1.583	0.225	2.384	0.461
16	0.653	1.030	0.199	1.836	0.634
17	0.729	1.107	0.155	1.945	0.659
18	*	*	*	*	*
19	0.676	0.877	0.125	1.845	0.770
20	0.126	0.073	0.023	0.336	1.725
21	0.591	0.870	0.119	1.567	0.679
22	0.000	0.000	0.000	0.000	0.000
23	0.000	0.000	0.000	0.000	0.000
24	0.000	0.000	0.000	0.000	0.000
25	0.000	0.000	0.000	0.000	0.000
26	0.000	0.000	0.000	0.000	0.000
27	-0.007	0.000	0.000	0.000	0.000
28	0.167	0.360	0.000	-0.373	0.465
29	1.018	1.470	0.156	2.681	0.693
30	0.010	0.000	0.000	0.000	0.000
SUM	9.197	15.264	2.132	25.123	0.603
AVG	0.307	0.509	0.071	0.837	0.020

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NOTE:

SOLAR HEATING AND COOLING DEMONSTRATION PROGRAM

MONTHLY REPORT
AUXILIARY STORAGE PERFORMANCE

SITE: REEDY CREEK
REPORT PERIOD: APRIL,1979

SOLAR/2018-79/04

DAY OF MONTH	ENERGY TO STORAGE MILLION BTU	ENERGY FROM STORAGE MILLION BTU	INCREASE IN STORED ENERGY MILLION BTU	STORAGE AVERAGE TEMP DEG F	STORAGE EFFICIENCY
1	0.000	0.000	0.034	54	1.000
2	0.592	0.000	0.598	58	1.000
3	0.395	0.798	-0.422	61	1.023
4	0.405	0.000	0.321	58	1.000
5	0.208	0.000	0.198	62	1.000
6	0.562	1.277	-0.758	60	1.034
7	0.000	0.601	-0.823	51	1.369
8	0.000	0.031	0.116	44	-3.716
9	0.058	0.353	0.718	50	-1.871
10	*	*	*	*	*
11	0.689	0.000	-0.045	58	1.000
12	0.197	-0.004	0.224	61	6.256
13	0.259	0.835	-0.553	60	0.973
14	0.000	0.000	0.037	56	1.000
15	0.000	0.730	-0.837	53	1.148
16	0.059	0.653	0.142	48	-0.128
17	0.062	0.729	0.041	49	0.029
18	*	*	*	*	*
19	0.696	0.676	0.168	52	0.782
20	0.625	0.126	0.609	56	0.126
21	0.000	0.591	-0.642	57	1.087
22	0.000	0.000	0.022	52	1.000
23	0.604	0.000	0.650	56	1.000
24	0.414	0.000	0.261	62	1.000
25	0.302	0.000	0.227	65	1.000
26	0.323	0.000	0.149	67	1.000
27	0.231	-0.007	0.093	69	-18.482
28	0.000	0.167	-0.105	70	0.625
29	0.000	1.018	-1.302	60	1.280
30	0.748	0.010	0.676	56	7.159
SUM	7.959	9.197	-0.216	-	-
AVG	0.265	0.307	-0.007	57	0.889

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*U.S. GOVERNMENT PRINTING OFFICE: 1979-640-189/4050. Region 4.

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